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THE DAMAGE ASSESSMENT PROCESS

2.1 INTRODUCTION

This chapter outlines the steps for conducting natural resource damage assessments under DOI's final rule and NOAA's proposed rule, with a focus on the role of economics within the natural resource injury and damage assessment process. While the most visible role of economics is in the estimation of compensable losses, economic tools can and should be applied throughout each assessment. Specifically:

- A preliminary estimate of economic damage (including both restoration costs and compensable values) should be established early in the assessment process. Trustees should update this estimate throughout the assessment process as additional information is obtained. Note that these estimates need not be made public, but can be used simply to support management of the damage assessment process.
- The preliminary damage estimate should be used to focus the injury assessment process, as reflected in the definition of "reasonable cost" contained in DOI's final rule [43 CFR 11.14(ee)]. Specifically, DOI defines costs as reasonable when:
 - the various phases of the assessment are coordinated;
 - the benefits of the studies undertaken (measured in terms of their contribution to precision or accuracy of the final damage estimate) exceed the costs of the studies; and
 - the cost of the assessment is less than the anticipated damages.

NOAA defines reasonable costs to mean those costs associated with performing an assessment in accordance with its proposed rule. NOAA's proposed rule, in turn, gives guidance for each phase of the assessment as to the reasonableness of assessment activities. The proposed rule requires that

any studies or procedures be directly related to the purpose of the assessment and are conducted in a cost-effective manner. This approach does not require the trustee(s) in the early stages of a release event to devise a preliminary estimate of total damages likely to result from the release. However, the proposed rule does require that the assessment be conducted in such a manner to avoid unnecessary and excessive costs.

- Economics has an important role in the restoration alternative selection and costing process. As described in Chapter 1, the selection of an appropriate restoration option may require a balancing of restoration costs with compensable losses, consideration of the cost-effectiveness of available options, and consideration of the relationship between expected costs and benefits of proposed restoration options. In addition, as described in Chapters 3 and 6, economic tools are used to assure that sufficient funds are recovered to allow for completion of selected restoration option(s).

The DOI and NOAA rules provide standardized procedures for estimating economic damages based on the cost of restoring injured natural resources plus the compensable losses incurred between the time of the release and full restoration of the resource. Trustees are not required to follow these procedures; however, trustees who follow these rules will obtain a rebuttable presumption under CERCLA (section 107(f)(2)(C)) or OPA (section 1006(e)(2)). Exhibit 2-1 compares the DOI and NOAA procedures for damage assessment. In general, the two rules are similar, with the most significant differences occurring in the defined assessment procedures.¹

Whether or not trustees follow these rules, the following phases should nearly always be included in a natural resource damage assessment:

- **Preassessment** -- notification of the responsible party and other trustee agencies, establishment of the protocol for coordination of damage assessment activities among trustees, collection and sampling of ephemeral data, and emergency response actions.
- **Assessment Planning** -- screening of available information, formal determination of whether to proceed with the damage assessment, selection of the damage assessment procedure, identification of scientific and economic methodologies to be applied within the assessment, and development of a preliminary estimate of economic damages.
- **Assessment** -- injury determination, injury quantification, and damage determination.
- **Post Assessment** -- completion of injury and economic damage reports, restoration accounting and restoration planning.

¹ For example, NOAA's rules include provisions for the application of compensation tables for determining damages due to oil or other hazardous material releases; compensation tables are not provided in the DOI rule.

Exhibit 2-1

COMPARISON BETWEEN DOI AND NOAA DAMAGE ASSESSMENT PROCESSES

DOI

NOAA

- I. Preassessment Phase
 - A. Preassessment Screen
 - B. Data Collection & Sampling
 - C. Preassessment Screen Determination

- I. Prespill
 - A. Prespill Planning
 - B. Trustee Coordination

- II. Assessment Phase
 - A. Coordination
 - B. Notification
 - C. Planning
 - D. Decision on Type of Assessment
 - 1. Type A or Type B
 - E. Assessment
 - 1. Injury Determination
 - 2. Injury Quantification
 - 3. Damage Determination

- III. Assessment Phase
 - A. Plan Development
 - B. Assessment (Comp Formula/TypeA/EDA/CDA)
 - 1. Injury Determination
 - 2. Injury Quantification
 - 3. Restoration
 - 4. Compensable Values Determination

- III. Post Assessment Phase
 - A. Report of Assessment
 - B. Demand
 - C. Restoration Account
 - D. Restoration Plan

- IV. Post Assessment Phase
 - A. Report of Assessment
 - B. Demand
 - C. Restoration Account
 - D. Restoration Plan

Source: National Oceanic and Atmospheric Administration, Proposed Rules for Natural Resource Damage Assessment, 59 FR 1070, January 7, 1994.

As described below, the activities performed under each of these phases can overlap; for example, trustees will often select an assessment procedure and establish a preliminary estimate of damages within the preassessment. In addition, the damage assessment process is often iterative, with progressively more detailed analyses and data gathering activities undertaken as the assessment progresses. The purpose of this chapter is to provide summary descriptions of each phase of a damage assessment, general guidance on the selection of an assessment approach, and a review of the advantages and disadvantages of each approach.

2.2 PREASSESSMENT

This first phase of a damage assessment involves activities required to initiate the assessment, such as: notification of the responsible party and other trustee agencies; establishment of protocols for coordination of damage assessment activities among trustee agencies; collection of ephemeral data (i.e., data that might be lost if not collected soon after a release, such as the number of boaters or bathers turned away from a spill area); and emergency response actions. In some cases limited sampling and primary data gathering and analysis is conducted in the preassessment stage of the assessment (e.g., to support the decision to move forward with an assessment).

In addition, under DOI's and NOAA's rules trustees are required to complete a preassessment screen, referred to as a "preassessment determination" in NOAA's proposed rule. The preassessment screen addresses such administrative issues as: is the release covered under CERCLA, CWA or OPA?; do the trustee(s) have authority to claim damages?; is there reasonable cause to proceed with the claim?; and is there a reasonable probability that the claim will succeed? [see 43 CFR 11.23 and 15 CFR 990.20-25]. As part of the preassessment screen, trustees also identify natural resources potentially at risk, exposure pathways to these resources, and the services that have been lost. These determinations will generally be based on existing information. For example, the release of oil to a mid-Atlantic river might result in the loss of freshwater wetland habitat, the death of several hundred birds and marine mammals, the temporary closure of a recreational fishery, and the temporary closure of a municipal drinking water intake. As part of the preassessment the trustees would consider these categories of injury, as well as the associated services that have been lost or diminished as a result of the spill. These services might include: the provision of clean wetland habitat; shoreline erosion prevention afforded by the wetland; recreational services provided by the wetland and associated wildlife (e.g., local bird viewing trips); recreational angling opportunities; and the provision of clean and inexpensive water for municipal water users.

Exhibit 2-2 lists common categories of injured resources and details some of the services provided by these resources. For example, as a natural habitat, coastal wetland provides services to other natural resources (e.g., a breeding and rearing environment for shorebirds), and to humans (e.g., passive use values). Such wetland also provides flood control and shoreline erosion prevention.

In practice, trustees often develop a preliminary estimate of economic damages as part of the preassessment. This estimate is nearly always based on readily available existing data, and should incorporate the cost of potential restoration actions, as well as any categories of compensable loss that might be included in the claim. General guidance on the development of a preliminary estimate of damages is provided in Section 2.3.1. This initial estimate will rarely be released to the responsible party, and be used simply to support the administrative decision to proceed with the assessment. Preliminary damage estimates can be highly uncertain; in fact, in some cases there will be insufficient information to generate a defensible estimate at this phase of the assessment. This activity will, however, provide the trustees with an indication of the types of studies required to complete the damage claim.

Exhibit 2-2

CATEGORIES OF INJURED RESOURCES AND LOST SERVICES

Example Categories of Injured Resources*	Example Lost Services **
Habitat (e.g., wetland, forested upland, grassland, riverine systems, coastal systems, sediments, coral reef)	Services provided to other resources, such as: clean water, sediments, soils, and food. Passive use
Fish and Wildlife	Recreation Education Cultural Commercial Passive use
National Parks, National Wildlife Refuges, National Monuments, other public lands	Habitat Recreation Education Preservation Cultural Passive use
Beaches, Rivers, Surface Water Bodies, Marine Corridors, Wetlands	Water quality Commercial use (e.g., municipal/ industrial/agricultural water supply; marine transport; economic development) Recreational use (e.g., swimming, fishing, hunting, wildlife viewing) Subsistence use Flood control/erosion prevention Education Research Passive use
Groundwater	Municipal/commercial/industrial/ agricultural use Discharge of clean groundwater to surface water Passive use
Archaeological and Cultural	Historical Cultural Education Research Passive use
<p>* The categories listed in this exhibit are not mutually exclusive (i.e., a release may result in injury to multiple resource categories, as well as a range of lost services).</p> <p>** The services provided by a natural resource can accrue to humans and to other natural resources, and need not be consumptive.</p>	

2.2.1 ASSESSMENT PROCEDURES AVAILABLE UNDER DOI AND NOAA RULES

One of the most significant decisions made by trustees in the preassessment will be the selection of an assessment approach.² DOI defines two options for conducting damage assessments: Type A (or "simplified") and Type B ("comprehensive") damage assessment procedures. NOAA's proposed rule defines four options: (1) application of compensation formulas, (2) application of the Type A model, (3) expedited damage assessment, and (4) comprehensive damage assessment. The Type A (i.e., computer model-based) procedures available under DOI's final rule and NOAA's proposed rule are the same. Application of NOAA's proposed compensation formulas is limited to cases involving discharges of ten to 50,000 gallons of oil, and where the trustees have determined that there has not been a significant loss in passive use values. There are no equivalent compensation formulas in DOI's rule. The expedited damage assessment guidelines provided by NOAA reflect a standardization of the simplified Type B assessments that are commonly conducted by natural resource trustees under CERCLA.

This section of the manual describes the available approaches for conducting natural resource damage assessment under DOI's and NOAA's rules. It also provides guidance for selecting from these approaches. In practice, there are a spectrum of approaches and procedures used to estimate economic damages. These range from simple application of the Type A model, to the formal application of benefits transfer techniques (as described in Chapter 5), to full-scale primary investigations. The selection of any one damage assessment approach does not preclude later selection of a different approach. In fact, many assessments are conducted as a series of progressively more detailed analyses. For example, a trustee may apply the Type A model to an oil spill, while initiating a more comprehensive assessment of damages. The initial results of the Type A model may provide insights into the likely magnitude of damages from the spill, or might be used in early settlement negotiations with the responsible party. As noted above, additional analyses and data gathering should be undertaken only if the benefits of the analysis or data exceed their cost. This approach allows the trustee to assess the value of additional effort at each stage of the assessment, and to identify the most promising avenues of analysis to follow.

Selection of an appropriate damage assessment procedure will depend on the characteristics of the case at hand, the level of funding and time available for the assessment, and the purpose of the assessment (e.g., to establish a preliminary estimate of damages as part of the decision to proceed with a full assessment, or for use in settlement negotiations with the responsible party). Specific questions to consider include, but are not limited to:

- Are simplified methods or models available to address the damage category of concern?
- Are there case-specific or site-specific factors that preclude the use of a simplified approach, or an approach based on benefits transfer (e.g., the discharge resulted in substantial injury to a unique or highly valued resource)?

² Under DOI's final rule, selection of an assessment approach is considered to be part of the "Assessment" phase (see Exhibit 2-1). In most cases, however, trustees will select an assessment approach during the preassessment.

- Are more detailed methods available for damage estimation, and are these methods likely to be applicable to the case at hand?
- Will a more detailed or case-specific analysis provide a significantly more accurate or defensible damage estimate?
- Is the expected improvement in accuracy or defensibility resulting from the application of a more detailed approach justified in light of the added cost?
- Is sufficient funding available to cover the cost of the assessment?
- Is sufficient time available to undertake more detailed or case-specific analysis?
- Is recovery of damages from the responsible party likely, including the cost of the assessment (i.e., does the responsible party have sufficient financial services)?
- What is the status of the relationship and communications between the responsible party and the trustees (i.e., is the responsible party likely to litigate or is a negotiated settlement likely)?
- Do the advantages of increased accuracy and completeness in the damage estimate outweigh the potential disadvantages of delays in resource restoration?

The type of damage assessment approach selected will often be dictated by the litigation calendar. For example, a responsible party may declare bankruptcy. Once this action is taken, the courts will dictate the schedule under which all creditors, including natural resource trustees, must present their claims. Thus, trustees may need to develop a reasonable remediation and restoration scenario (if one has not been selected for the site) as well as an estimate of compensable value within the time constraints of the bankruptcy proceeding. Similarly, statute of limitations issues or other legal constraints may force trustees to estimate damages prior to selection of a final remedy for a site. In these cases trustees will need to project such factors as the expected timing of resource recovery and the expected effectiveness of site remediation activities in order to estimate damages.

The cost of conducting a damage assessment will vary depending on several factors, including the types of natural resource services affected, the amount and quality of available data, and the nature of the natural resource injury. For example, detailed data on recreational behavior (e.g., number of recreational anglers who traditionally visit a site) are often collected by resource management agencies. While the quality of these data vary, in some cases these estimates may be sufficient to meet the needs of the damage assessment (e.g., a case in which a negotiated settlement is likely). Similarly, existing estimates of the cost of restoring injured wetland may be available for use in establishing a restoration cost estimate. In other cases, existing data may not be available, prompting the need for primary data gathering or analysis.

Below are brief reviews of the various general techniques available for damage assessment.

2.2.1.1 COMPENSATION FORMULAS

Under OPA, the simplest option for estimating economic damages involves the application of compensation formulas [see 15 CFR 990.40]. These formulas may be used for spills between 10 gallons and 50,000 gallons, as long as trustees determine that the loss in passive use values resulting from the release is not significant. These formulas estimate economic damages based on predicted average restoration costs and average lost use values. Natural resource injury is predicted based on several factors, including the season, type and quantity of oil released, and region and type of habitat affected. Separate formulas have been developed for spills in estuarine and marine environments, and inland waters.

If trustees decide to apply NOAA's compensation formula, damages estimated using the formula are added to any economic losses estimated by the trustees for beach or shoreline closure or lost boating days (for inland waters), and the cost of conducting the assessment. Other categories of damage may be included as long as their inclusion does not result in double counting. A brief discussion about the application of the compensation formulas is provided in NOAA's proposed rule [15 CFR 990.41 and 990.42]. More detailed discussion is contained in the documents "Compensation Formula for Natural Resource Damage Assessments under OPA: Oil Spills into Estuarine and Marine Environments," and "Compensation Formula for Natural Resource Damage Assessment under OPA: Oil Spills into Inland (Freshwater) Waters."

2.2.1.2 TYPE A MODEL PROCEDURES

DOI has developed two simplified models for estimating economic damages from releases of oil or other toxic substances: the Coastal and Marine Environments Model (CME) and the Great Lakes Model (GLE). The CME model was finalized in March 1987 [52 FR 9042] and revisions were proposed in December 1994 [59 FR 63300]. The GLE was proposed in August 1994 [59 FR 40319] and had not been finalized at the time that this manual was written. In its proposed rule, NOAA indicates that trustees may use the CME under OPA and that it is likely to adopt the GLE as well.

These models consist of three main components: (1) a physical fates submodel used to determine injury; (2) a biological effects submodel used to quantify injury; and (3) an economic damages submodel used to determine economic damages. Use of the model requires information on the characteristics of the release (e.g., substance and quantity), parameters related to the release and the resources likely to be affected (e.g., the location of the spill, the type of environment affected, wind speed at the time of the spill) and information regarding lost services (e.g., length of beach closure, area of hunting closure). Readers should refer to the guidance manuals for these models for a complete discussion of their use, and to DOI's and NOAA's rules for guidance on when the use of these models is appropriate.

2.2.1.3 EXPEDITED DAMAGE ASSESSMENT/SIMPLIFIED TYPE B ASSESSMENT

In its proposed rule under OPA, NOAA included a damage assessment procedure usually referred to as "expedited damage assessment." This procedure is intended to offer flexibility to trustees in estimating economic damages, recognizing that the Type A model may not address all the types of resources affected by a hazardous material release event, but at the same time recognizing that a comprehensive damage assessment may not always be warranted. Note that while DOI does not specifically describe this approach in its current rules for damage assessment under CERCLA, numerous assessments conducted by Interior agencies can be classified as "expedited" assessments.

Estimating economic damages using expedited damage assessment procedures essentially requires following the same steps, but in less detail, as those required in a comprehensive damage assessment: injury determination, injury quantification and damage determination. Expedited damage assessment, however, involves the use of simplified valuation methods, such as the habitat equivalency model or benefits transfer techniques, as opposed to more expensive and time consuming primary valuation approaches (as described in Chapter 4). Thus, within an expedited damage assessment the economic valuation step is likely to rely heavily on existing information and, possibly, limited primary data gathering efforts.

2.2.1.4 COMPREHENSIVE DAMAGE ASSESSMENT/FULL TYPE B ASSESSMENT

The final option available to trustees to evaluate economic damages is the comprehensive or Type B damage assessment procedures. This assessment approach is employed in cases involving significant injury to resources resulting in substantial direct use and passive use losses. These types of cases may require detailed, site-specific scientific and economic studies to determine and quantify injury, and to evaluate economic damages. Such assessments will generally involve teams of government and private sector investigators, and may take years to complete.

For example, wide-scale contamination of a marine bay system or inland waterway will likely require primary assessment activities to define the extent of contamination, potential remediation alternatives, the type and scope of lost resource services, and the resulting loss in direct use and passive use values (as defined in Chapter 4). Note, however, that it will generally be appropriate to construct a preliminary estimate of damages, using the same types of data and techniques as might be used in a Type A or expedited assessment, prior to undertaking such primary data gathering or analysis.

2.3 ASSESSMENT PLANNING

The second phase of DOI's damage assessment procedures is the development of a plan for conducting the natural resource damage assessment [see 43 CFR 11.30 through 11.35]. The purpose of this phase of the process is to ensure that the assessment is performed in an organized and systematic manner and at reasonable cost. This phase includes the following:

- Continued coordination among trustees (e.g., designation of a lead trustee).
- Identification and possible involvement of potentially responsible parties.
- Formal selection of the type of assessment procedure to apply (e.g., Type A or Type B).
- Identification and documentation of the scientific and economic methods to be used in developing the damage estimates, including estimates of the costs to perform the studies.
- For Type B assessments, development and documentation of sampling, quality control and quality assurance plans.
- For Type B assessments, development of a preliminary estimate of economic damages.

In section 2.3.1 we review the steps followed in developing a preliminary estimate of damages, and in section 2.3.2 we provide additional guidance on the development of the damage assessment plan.

2.3.1 DEVELOPMENT OF A PRELIMINARY ESTIMATE OF DAMAGES

Under DOI's rule for damage assessment under CERCLA, trustees must "develop a preliminary estimate of: the anticipated costs of restoration, rehabilitation, replacement, and/or acquisition of equivalent resources for the injured natural resources; and the compensable value...of the injured natural resources" [43 CFR 11.35(a)]. The purpose of this estimate is threefold: (1) to provide an order-of-magnitude estimate of economic damage for use in administrative decision making and settlement negotiations with the responsible party; (2) to allow the trustees to identify categories of injury that should be valued as part of a full damage assessment; and (3) to confirm that the costs of conducting the damage assessment using the selected methods are reasonable and justifiable.

In addition to restoration costs, the preliminary estimate of damages may include compensable values (i.e., the economic value of any services that have been lost or diminished as a result of the release event from the point in time when the release occurred through full restoration of the resource). This preliminary estimate will generally be based on existing data and limited primary field study. The preliminary damage estimate can be expressed as a range of values, explicitly reflecting uncertainties in the available information.

In the course of developing the preliminary estimate trustees may find that: (1) methods do not exist to quantify the magnitude of economic damage for a particular resource and/or service; or (2) methods exist, but the data required to complete the analysis using these methods are not available within the scope of this phase of the assessment. At this time, efforts should be made to bound the

potential magnitude of economic damage using reasonable assumptions. Where sufficient information is not available even to allow for an order of magnitude estimate of damage, a qualitative description of the damage category should be developed. If the available information indicates that the magnitude of damages is likely to be significant, a more detailed analysis can be conducted as part of the full damage assessment. Several of the case studies presented in later chapters of this manual represent assessments of the form common to preliminary damage assessments.

The steps typically followed in developing a preliminary damage estimate are:

- Step 1: Review available data on the release and the site;
- Step 2: Identify categories of natural resource injury;
- Step 3: Identify natural resource services potentially affected by the release;
- Step 4: Select services for analysis;
- Step 5: Identify and describe available restoration options (including the likely cost of such options, and the extent to which, and the time frame in which, these options will restore the injured resource and lost or diminished service flows);
- Step 6: Identify methods and data sources to estimate damages, considering the types of data required and available to complete the damage calculation;
- Step 7: Estimate the magnitude of lost services (e.g., lost user days);
- Step 8: Estimate economic damages by assigning economic values to the lost services; and
- Step 9: Define major uncertainties and limitations to the analysis.

Note that these steps will apply for any type of natural resource damage assessment (e.g., preliminary, expedited, comprehensive). The primary difference relates to the level of effort committed to the assessment. Typically, a preliminary damage assessment will rely on readily available data and existing studies. In contrast a full-scale damage assessment will require primary data gathering and other field investigations.

2.3.1.1 SELECTION OF SERVICES FOR ANALYSIS

Trustees generally will have conducted Steps 1 through 3 as part of the preassessment phase. At this stage, trustees should review any new information obtained since the preassessment determination to identify injury to natural resources and services potentially affected by the release or spill. Based on this review, trustees will develop a list of potentially affected services.

Step 4 entails selecting services for further analysis. In considering compensable losses, an obvious criterion in selecting from the list of disrupted services is the expected magnitude of economic damages. For example, a reduction in recreational fishing opportunities may have resulted from an oil spill event, but the expected magnitude of the this loss may not warrant the effort required to develop a quantitative damage estimate for this category of natural resource service (e.g., the closure may have only extended for a few days). The availability of sufficient information on the nature and magnitude of injury will also be an important determining factor in the selection of services for further analysis.

2.3.1.2 IDENTIFICATION AND COSTING OF RESTORATION OPTIONS

The fifth step in the development of a preliminary damage estimate is to evaluate available restoration options. This step includes gathering information on the expected cost, effectiveness, and timing of each option. Information on the likely timing and effectiveness of potential restoration actions will be required to develop a preliminary estimate of compensable losses, since these losses will continue to accrue during the restoration process. In developing a preliminary estimate of expected restoration costs, trustees should take into account the ability of the injured resources to recover naturally, as well as the anticipated effects of any spill response or hazardous site remediation actions. A further discussion of restoration costing is included in Chapter 3.

2.3.1.3 ESTIMATING COMPENSABLE LOSSES

Steps 6 through 9 in the development of a preliminary estimate of damages involve the estimation of compensable losses (e.g., the monetization of lost services resulting from the time of the release through full recovery of the resource). After selecting those services that merit further analysis, trustees identify the methods and data sources available for estimating economic damages. As described in Chapters 4 and 5, there are an array of valuation methods available for use in evaluating compensable losses. For the purpose of preliminary damage assessment, trustees should focus on simple methods that do not require intensive data collection or primary analysis. These methods may include benefits transfer, the habitat equivalency approach, as well as some market based approaches (such as market price, added or avoided cost, and estimation of lost fees).³ Note that application of a simplified approach at this phase of the assessment does not limit the use of primary valuation techniques later in the assessment.

In estimating the magnitude of lost services, trustees should compare the baseline level of services provided by the resource (i.e., the level of services that would have been provided by the resource in the absence of the release) to the level of services experienced after the release. Note that the magnitude of lost services may vary over time as the resource recovers from the release event, either naturally or in response to restoration activities undertaken by the trustees. The recovery rate may vary by service category, and thus should be considered separately for each category of service

³ Readers should note that application of the habitat equivalency approach, while simplified in an economic sense, may require significant scientific assessment.

lost or diminished as a result of the release. For example, the amount of oil present in a wetland following a spill event may decline in a short period of time to a level at which bird watchers are willing to return to view birds. Restoration of the same wetland as a fully functioning nursery for juvenile fish, however, may require a longer period of time.

After the magnitude of lost services has been quantified, trustees next must apply a dollar value to this flow of services. For purposes of the preliminary assessment, these values should be estimated based on existing data and simplified valuation approaches, such as benefits transfer. For example, valuation of the closure of a marine transportation corridor would probably rely on readily available site-specific data, while valuation of lost or diminished recreational opportunities might rely on benefits transfer. In some cases existing data will not be sufficient to allow for the development of a preliminary compensable damage estimate. In these cases trustees should develop a qualitative description of the economic effect. For example, trustees may believe that the release of a hazardous substance has resulted in injury to an endangered species population; however, the magnitude of the injury might be unknown at this phase of the assessment. In this case the trustees would note that passive use values for this resource may have been diminished, and might propose studies to better define the magnitude of the loss.

The final step in the preliminary assessment process involves the documentation of significant sources of uncertainty and limitations in the analysis. This step is key to the selection of injury categories and services for further analysis, and in the prioritization of damage assessment studies. In planning the damage assessment, trustees should focus on those studies that: (1) are required to document injury at the site; (2) will support selection and costing of restoration options for the site; and (3) will allow for the development of a defensible and accurate compensable damage claim for direct use and passive use losses at the site. In selecting studies for development of a compensable damage claim, trustees should place the highest priority on those categories of damage that are of the greatest magnitude, and which demonstrate the greatest uncertainty. In reporting the preliminary estimate of restoration costs and compensable losses, it may be appropriate for trustees to generate a range of damage estimates, reflecting alternative injury and valuation assumptions. In this case, the assumptions used to generate these estimates should be clearly stated. In addition, any significant sources of uncertainty that are not explicitly captured in these estimates should be defined and discussed (further discussion of uncertainty in damage assessment is provided in Chapter 7).

Consider the following simple example:

Ongoing releases of toxic metals from an abandoned mine site have resulted in injury to fish and wildlife populations downstream from the site. Specifically, the trustees have identified two categories of injury for further analysis: (1) reductions in fish populations due to acute mortality at the site (including several species popular with recreational anglers), and (2) reductions in the reproductive success of several endangered bird species in the area of the release. In addition, due to wide-spread public concern over the environmental effects of the site, the trustees believe that passive use losses may exist for the site. Remediation actions planned for the site will halt further releases from the site, but will result in the loss of several acres of freshwater wetland.

Exhibit 2-3 provides a summary of the results of Steps 6 through 9 of the preliminary assessment conducted for this case. As shown, for each impacted service category the trustees have estimated the magnitude of the lost services (e.g., number of fishing trips displaced), as well as the economic loss associated with these service impacts. In those cases for which insufficient information was available to establish a compensable loss estimate the trustees have considered the potential unit value of the loss in services. For example, the loss of clean habitat is believed to have resulted in a reduction in reproductive success for several pairs of bald eagles. This loss is valued in the third column of Exhibit 2-3 based on the cost of providing clean replacement habitat (as described in Chapter 4, the habitat equivalency method can be used to compensate the public for past losses in environmental services through the provision of additional services of the same type in the future). For each category of damage, the trustees note the principal uncertainties associated with the preliminary damage estimate in order to focus any additional studies that are conducted. In addition, the trustees identify primary valuation approaches that could be applied in a full assessment.

2.3.2 PREPARATION OF A DAMAGE ASSESSMENT PLAN

Once the decision is made to proceed with a full damage assessment, the final task in the preassessment determination is the development of a damage assessment plan. The damage assessment plan represents a formal summary of the results of the preassessment determination and a generalized plan, including descriptions of the types of studies required and cost estimates for these efforts, for the investigations required to complete a full damage assessment. While the degree of detail provided will vary from case to case, damage assessment plans should incorporate that information required to facilitate and focus the damage assessment process. The assessment plan can serve the following purposes:

- Identify the scientific and economic methodologies that the damage assessment team expects to apply during the full damage assessment;
- Identify available restoration and replacement options and outline the selected approach to further investigation of these options;
- Provide information that demonstrates that the damage assessment can be performed at reasonable cost and within a reasonable time frame, and that the identified approach is the most cost effective available;
- Provide formal justification for selection of the proposed assessment methodologies;
- Facilitate coordination among parties involved in the damage assessment; and
- Identify procedures and schedules for conducting the assessment, including schedules and plans for collecting data and sharing it with potentially responsible parties.

Exhibit 2-3

EXAMPLE: PRELIMINARY ESTIMATE OF COMPENSABLE LOSSES

Service Category	Magnitude of Lost Services	Preliminary Economic Damage Estimate	Uncertainties and Limitations	Primary Valuation Approach
Recreational Fishing	10,000-20,000 trips/year displaced, 1980 (year in which fishing restrictions put in place) to 2010 (year in which fishing restrictions are expected to be lifted).	\$50,000-\$100,000/year.	Value per displaced trip. Number of trips/year displaced.	Travel cost model.
Clean Habitat for Endangered Bird Species	Several pairs of bald eagles have experienced reduced reproductive success. Injury is believed to have existed since 1965, and is expected to continue until 2020 (year in which full recovery is expected).	Unknown. Cost of replacement breeding habitat is estimated to be \$60,000 per nesting pair; additional damages will be estimated for compensation for past losses.	The number of breeding pairs affected; the availability of substitute and compensatory habitat.	Cost of replacement habitat. Habitat equivalency approach.
Productive Wetland	5 acres (following site remediation)	\$100,000, based on the cost to replace this lost habitat.	No significant uncertainties.	Replacement cost.
Passive Use Values	Passive use losses for 1.5 million households in the state in which the site is located; from 1980 (year in which site became public) to 2020 (year in which full recovery is expected)	\$10/household/year, or \$15 million annually.	Willingness to pay per household.	Contingent valuation.

Formats for damage assessment plans will vary depending on the unique conditions of a case, time and funding constraints, and the legal status of the case. For example, negotiations may necessitate the development of a preliminary plan. Similarly, time constraints associated with some release events may require the preparation of preliminary study designs and interim reports. The form and scope of the damage assessment plan should be established to best meet the needs and conditions of the case at hand. However, in all cases the plan should identify the need for further investigations, describe how these additional investigations will address significant uncertainties or unknowns identified in the preassessment determination, establish

an estimate of the cost of conducting these additional investigations, and define the time required to complete such investigations.

2.4 ASSESSMENT

Once the preassessment and assessment plan or preassessment phase report are complete, the trustees will proceed to conduct the damage assessment, assuming settlement has not been reached or a determination to terminate the assessment process made. This section provides a general description of the steps followed in a Type B assessment (whether expedited or comprehensive), which include injury determination, injury quantification and damage determination, with a focus on the data and steps required to support the development of an economic damage claim. This section also provides a review of issues encountered in undertaking primary data gathering to support a damage claim. In addition to outlining the steps followed in completing the assessment, this section also reviews issues associated with gathering primary data to support estimation of compensable losses.

2.4.1 INJURY DETERMINATION

In this first step of the assessment phase, trustees identify categories of natural resource injury resulting from the release of oil or other toxic substance. The focus of these efforts should be on categories of injury that can be documented to support a restoration or compensable value claim. For example, a study to fully define the extent to which a release event may have resulted in a change in the nature of the benthic invertebrate community at a site may yield important scientific findings, but may not provide information to the restoration planning process or economic assessment process. Specifically, trustees need to determine that (1) injury has occurred to trust resources, and (2) the injury resulted from the discharge of oil or toxic substance from the incident or site in question.

The steps to injury determination generally include:

- Identify types of resources potentially affected;
- Conduct sampling and testing of these resources;
- Determine if injury to these resources has occurred; and
- Determine the exposure pathways causing the injury.

DOI's rule provides guidance on determining the exposure pathways and on testing and sampling techniques appropriate to damage assessment [43 CFR 11.63 and 11.64].

2.4.2 INJURY QUANTIFICATION

In the second phase of the assessment process, trustees quantify the extent of injury and consider the reduction in the quality and quantity of services provided by the injured resources. As in the injury determination stage, the focus of this phase of the assessment is on the development of information to support the selection and design of restoration options, and on the documentation of compensable losses.

In the injury quantification phase of the assessment, trustees attempt to place numerical bounds on the extent of the injury, such as the time period over which the injury occurred, the area over which the resource was injured, and the severity of the injury (e.g., concentration of contaminants in groundwater, extent of reproductive failure in a bird or fish species). The time period over which the injury has (and will) occur is important to the ultimate quantification of compensable values. This step may require the development of estimates of the ability of the resource to recover in the absence of any restoration activities, and the extent to which the resource will recover under various proposed restoration options. Note that impacts by other hazardous substances or other anthropogenic effects (e.g., a dam, urban development) may require identification and quantification in order to isolate the effects of the release.

The injury quantification stage of the assessment also involves consideration of lost services. Trustees will typically complete the following steps:

- Identify services affected;
- Quantify baseline service levels prior to the release;
- Quantify post-release service levels; and
- Estimate lost services based on the difference between baseline and post-release service levels.

The results of this process are used in the damage determination stage to support compensable value determination. Therefore, it is important that these estimates are consistent with the data needs of the damage determination methods to be employed. In addition, quantification of lost services should only be conducted for those resources for which damages will be sought, or for which restoration options will be developed.

2.4.3 DAMAGE DETERMINATION

In this third step of the assessment process, trustees estimate the monetary damages resulting from the release event. This step involves estimating restoration costs and placing a dollar value on compensable losses. Again, this phase of the assessment should focus on the most substantive damage categories.

A wide-range of primary and secondary methods are available to evaluate compensable losses associated with natural resources, as discussed in Chapters 4 and 5 of this manual. Selection of an appropriate method(s) will depend on the specific service being valued, the type and quality of available data to support the assessment, the ease and cost of collecting additional data, the magnitude of expected damages, and the availability of funding to undertake the assessment. As part of the preassessment or assessment planning phase, trustees will generally have selected methods for use in damage determination. Trustees should review these selections and the results of the injury quantification phase to confirm that selected methods are still appropriate.

Once the damage determination is completed, the trustees will be able to present the final damage claim to the responsible party, and move to develop a formal restoration plan for the site.

2.4.4 DATA GATHERING TO SUPPORT COMPENSABLE VALUE DETERMINATION

Primary data collection activities for purposes of compensable value determination generally fall into two categories: (1) collection of data to quantify the magnitude of lost resources or services; and (2) collection of data to monetize these losses. Quantification of lost services might include assessing the number of acres of injured wetland, the expected time to full recovery of these acres, and the pattern of services provided by these wetland acres prior to full recovery. Alternatively, trustees might use survey research techniques to define changes in recreational use patterns in response to a release event. Examples of primary data required to monetize a loss include the values individuals place on a day of recreational activity at a site, and individuals' willingness-to-pay to restore a resource to pre-release conditions. In some cases, trustees might develop a survey instrument to address both of these data needs. For example, a survey might ask how often members of a household visit a given site, and if they would be willing to pay for an improvement in the quality of the site (through a higher site access fee, for example). In some cases data collection will involve specific user groups, while in other cases a survey sample might include representatives of the entire United States population.

Two issues are commonly encountered when considering primary data collection for purposes of damage assessment: the need for focused investigations and the collection of perishable data. These issues are discussed below.

2.4.5 THE NEED FOR FOCUSED STUDIES

As noted earlier in this manual, primary analyses and data gathering activities undertaken for purposes of damage assessment should be focused on establishing proof of injury, quantifying the magnitude of economic loss associated with such injury, and selecting an appropriate restoration option(s). As stated in DOI's 1986 preamble to the original Type B rule,

[g]eneral research studies are not compensable under a damage assessment performed pursuant to this rule, since it is inappropriate that experimental research studies to advance general scientific understanding be included as a part of a specific natural resource damage claim [51 FR 27710].

Thus, adequate consideration should be given to the need for primary analyses to support the damage claim, so that limited assessment funds can be focused on documenting those injury categories and service flow losses that will generate the greatest damages, in terms of restoration costs or compensable values.

2.4.6 PERISHABLE DATA

The data required to complete a damage assessment may be ephemeral or perishable. For example, failure to collect data on the number of birds killed as a result of an oil spill at the time of the release may make it difficult to make such determinations at a later date. Similarly, characterization of changes in recreational use of a site years after a release event can be difficult and highly uncertain. Thus, trustees should consider the need for immediate data collection following a release event, especially events of limited duration (e.g., oil spills). For example, a major oil spill might result in the oiling of beaches and other resources associated with a National Wildlife Refuge. In this case a Service employee might be assigned the role of quantifying the effect of the spill on recreational use of the Refuge, in terms of total visitation, the extent of area closed to the public, and the reaction of the public to the event. This effort may involve informal data gathering activities (e.g., simply inventorying, for each day of the event, the portion of the park that is affected), or formal survey methods (e.g., a formal survey of individuals who continued to visit the site, to determine their lost use values). Such efforts will be especially important in cases where other types of data on pre-release conditions are not available (e.g., car counts taken at a park entrance).

2.5 POST ASSESSMENT

The post assessment phase generally consists of four components that are necessary to finalize the damage claim. These include:

- **Finalization of the Damage Assessment Report** -- development of a formal written report describing the determinations made in each phase of the assessment.
- **Presentation of Demand** -- presentation of the final damage claim to the potentially responsible party(s), including expected restoration costs, compensable losses, and the cost of the assessment.
- **Establishment of the Restoration Account** -- placement of recovered damages in a financial account.
- **Development of a Restoration Plan** -- preparation of a detailed restoration plan, describing the selected restoration activities to be funded under the claim.

In DOI's rule, the requirements for this stage of the assessment are codified at 43 CFR 11.90 through 11.93. In NOAA's proposed rule under OPA, these requirements are described at 15 CFR 990.80 through 990.84.g17